SPECIES LIFE HISTORY AND HABITAT REQUIREMENTS

PRONGHORN ANTELOPE

81287076
ID 88018995

BLM LIBRARY
SC-324A, BLDG. 50
DENVER FEDERAL CENTER
P. O. BOX 25047
DENVER, CO 80225-0047

QL
737
.U52
P7663
1970

PRONGHORN ANTELOPE

Table of Contents

Page

A. Distribution 1
   1. Historical
   2. Present

B. Habitat 1

C. Life History 2

D. Movements 3
   1. Home Range
   2. Migrations
   3. Fences

E. Habitat Factors 5
   1. Cover
   2. Food
      a. Quantity
      b. Quality
      c. Composition
         (1) Selection
         (2) Variety
         (3) Feeding Observations
         (4) Stomach Analyses
      d. Salt
   3. Water
   4. Space

F. Management Factors 21
   1. Compatibility with Other Wildlife
   2. Compatibility with Livestock
      a. Cattle
      b. Sheep
   3. Damage to Cultivated Crops

Tables:

   1. Percentage Distribution of Antelope by Principal Vegetation Types in Central Montana 2

   2. Antelope Winter Distribution in Relation to Sagebrush Density 5

   3. Seasonal Forage Consumption by Antelope 6

   4. Feed Values, Sagebrush and Alfalfa 7

5. Forage Production, and Utilization by Antelope on Study Pastures, Red Desert, Wyoming 8

6. Forage Production and Utilization in the Atriplex-Artemisia Type in Southwestern Utah 9

7. Winter Food Habits of Antelope in Central Montana, Based Upon 13,758 Observations at 28 Feeding Sites. 12

8. Summary of Antelope Food Habits Data as Indicated by Rumen Analyses 13

9. Principal Antelope Forage Species Based on Rumen Analyses 16

10. Plants Consumed in Low Volume but High Frequency (California) 19

11. Forage Consumption of Antelope and Sheep in Study Pastures, Wamsutter, Wyoming 23

12. Estimated Pounds Consumed Per Acre of the Principal Forage Species as Determined by Range Analysis . . 23

Plant Reference List 25

Literature Cited 28

PRONGHORN ANTELOPE

A. Distribution.

1. Historical. Before it was influenced by the white man, the pronghorn range extended from the prairie provinces of Canada to tablelands of central Mexico and most of Lower California. It occupied land that is now part of each western state, excepting Washington. Eastward, it reached Minnesota, Iowa, and the Gulf Coast. (18)*

2. Present. The eastward extent of the Antelope's range has retracted to about the 101st Meridian. Elsewhere, the original perimeter has shrunk almost everywhere - notably on the Canadian prairie and the central valley of California. Much of the former winter lowland range has been usurped by humans. Within much of the range, its distribution consists of scattered herds. In the United States, one sub-species, the Sonoran Pronghorn, is listed as endangered by the Bureau of Sport Fisheries and Wildlife. Recent estimates of the species population, at 365,000, amount to one percent of conservative estimates of its former abundance; however, there has been an upward trend in numbers during the past 40 years. (16, 18, 35)

B. Habitat. The natural home of the pronghorn was on the treeless, grassy, and often desert plains of the Continent. East of the Rocky Mountains, antelope were abundant on the short grass plains. In the Great Basin they inhabited the semi-desert bunch grass and low sagebrush ranges. In the southwest, antelope occupied the Salt Desert shrub type and bands sometimes wintered among the pinyon-juniper forests. They also frequented the open, grassy, ponderosa pine forests of the mountains, particularly in the park-like openings. (18)

In Wyoming where antelope are most abundant they inhabit a great diversity of vegetation types but the sagebrush-rabbitbrush-forb combination is preferred. In late summer, wet meadows or drainages attract antelope. (36). On the Red Desert, the aspect is big sagebrush, six to twelve inches high, except in occasional ravine bottoms. In the Great Basin several low-growing sagebrush species comprise the vegetation type frequented by antelope. They normally avoid dense stands of head-high big sagebrush where visibility and mobility are restricted. In central Montana, the big sagebrush-grassland type on the rolling plains has received the greatest use. Here, sagebrush heights averaged 11 inches. (2, 7, 24)

---

* Refers to Literature Cited

The sagebrush-grassland vegetation type occupied 51% of a study area in central Montana. (2) Antelope use of the type, based on 9345 observations, during the winter averaged 71%; and, in summer averaged 41% (2305 observations). Utilization of grassland increased, and use of sagebrush-grassland decreased, as summer progressed. See Table 1.

Table 1. Percentage Distribution of Antelope by Principal Vegetation Types in Central Montana. (2)

Month	Sagebrush-grassland	Grass-land	Grease-wood	Greasewood-sagebrush	Crop-land
Dec.	67	4	10	13	6
Jan.	86	4	5	3	2
Feb.	62	6	-	31	-
Mar.	70	7	-	23	-
Winter	71	5	4	18	2
June	53	24	5	9	9
July	50	24	2	6	17
Aug.	44	31	1	16	8
Sept.	16	45	1	17	22
Summer	41	31	2	12	13

In New Mexico antelope range from the short grass and desert shrub up to the mountain grasslands, pinyon-juniper and into the edge of the ponderosa pine-Douglas fir type. (22)

In Texas and Oklahoma antelope showed definite preference for open grasslands but travel wooded hillsides and in canyons when necessary. (5)

C. Life History. Prior to the breeding season, which reaches a peak in September, bucks gather small harems of up to six or eight does. Antelope commonly breed as yearlings. As winter approaches, antelope gradually gather into large bands and begin their migratory movements. On spring range, does isolate themselves a week or ten days before the fawns are born in May or June. Twin births commonly occur. Young are able to run with the does in ten days to two weeks and remain dependent about two months. Weighing about seven pounds at birth, the young antelope will go into its first winter weighing 50 to 75 pounds. Adults weigh 90 to 115 pounds; may live to an age of nine or ten years. In a Wyoming fenced antelope study (24), the yearlong average live weight of antelope in the pastures was 98.2 pounds.

D. Movements.

1. Home Range. Early writers noted the limited home range of antelope bands with estimates such as 3 or 4 miles across; 6 or 8 miles in diameter; and, 1 square mile. Einarsen (12) estimated a daily range of about 3 square miles in Oregon and said antelope drift from one range to another without seasonal rhythm. Rouse (cited in 30) said antelope movements apparently are most affected by storms, forage supplies and availability of water rather than any fixed migration pattern or seasonal movement. Buechner (5) in Oklahoma wrote that in spring small bands of does and fawns remained in small areas one-quarter to one-half mile in diameter for several days at a time. Bucks ranged as singles or in small herds until does began grouping into larger units. It has been pointed out (15) however, that antelope do not thrive when restricted, and transplanting sites should have at least one square mile of range for each animal.

Home range studies in central Montana showed average ranges of 19 antelope during the summer period June to September as follows:

Males alone or with females and young	1.54 sq. mi.
Males with male herds	6.43 " "
Females and females with young (with or without 1 male)	4.46 " "

Results of 579 winter (December to March) observations of 16 antelope were as follows:

6 adult females	2841 ac.	(4.4 sq. mi.)
1 yearling female	5574 "	(8.7 " ")
3 fawn females	2417 "	(3.8 " ")
1 yearling male	4160 "	(6.5 " ")
5 fawn males	1580 "	(2.5 " ")

Fawn females had the most variable range size (915-4691 ac.). Eight of the 16 animals shifted their home range to new areas. (2, 32)

2. Migrations. In central Montana, most antelope left the outlying range areas with the first severe snow storms and wintered in rough "breaks." These antelope moved from ten to 23 miles seasonally. (8) In northwestern Nevada years ago, a herd regularly wintered 40 to 50 miles south of its summer range. (18) In other early reports, Bailey (1) stated that in some places, antelope spring and fall migrations extended over at least several hundred miles. Seton (23) reported that, at the first heavy snow, the antelope of the upper Jackson Hole, Wyoming, travel 150 miles southward to the Red Desert. And, those on the prairies of Saskatchewan move into the coulees one hundred miles southward. On southern ranges, antelope seasonal movements were local and irregular. When climate and food supply permitted, antelope remained as permanent residents. (23)

3. Fences. Some range fences prevent the free movement of antelope. (30) Sheep-proof fences, railroads and highways sometimes are effective barriers to antelope. (6) Nelson (18) reported heavy losses before 1920 in Montana, South Dakota, and in Alberta-Saskatchewan where thousands of animals drifted against fences along the railway. Starting about 1940, many miles of woven-wire sheep-proof fences were erected on antelope ranges resulting in numerous reports of herd losses. (6, 22)

A BLM cooperative research project in Wyoming determined that of 22 fence types or devices tested, those imposing the least interference with antelope movement and yet effectively holding sheep were: 32 inch net wire, 26 inch net wire plus one barbed wire 4 inches above the net, and standard cattleguards. Approximately 32 inches was the maximum fence height which most adult antelope readily crossed. (30) They can pass under fences where the lowest wire is 16 inches or more above the ground. Cattleguards, and the specially designed antelope passes (a smaller, economical version of cattleguard), should be placed where antelope can readily locate them - as on established routes of travel and in fence corners. (36, 37) (See 9172.21 for standard specifications.) In Montana and Wyoming, some of the densest concentrations of antelope occur on large fenced ranges where, normally, yearlong antelope requirements are met. (36) While in the Rosewell area of New Mexico woven wire sheep proof fences are recognized as decimating antelope. (22)

E. Habitat Factors.

1. Cover. Antelope typically frequent open, rolling plains. Low growing sagebrush-grassland and similar semi-arid vegetation types permitting good visibility are commonly preferred. Cover is not a factor for adults except during periods of severe storms when, in some areas, antelope move into breaks and coulees and even woodlands. (15, 18) Terrain covered by high, dense sagebrush usually is avoided. (12) The aspect of typical antelope range on Wyoming's Red Desert is big sagebrush six to twelve inches high. (24) In the Great Basin, low shrubs nine to eighteen inches high provide the most satisfactory kidding ground. (12) Cultivated fields, such as of grain or alfalfa, may be utilized throughout since visibility rather than escape cover is required. (7, 8)

The following observations on utilization of cover (mostly by captive animals) were made incidental to the Wamsutter, Wyoming fencing study. When pursued through dense stands of brush, as when airplanes were used to drive antelope to the study site, individuals sometimes would suddenly drop into the brush and remain hidden. When frightened, antelope followed somewhat well-defined paths which usually coursed along the natural contours or draws that were sufficiently open to permit unrestricted movement. Even in winter they utilized draws which usually had deeper snow rather than the wind-blown bare ridges. During winter snow storms and high winds, antelope generally seek shelter in brushy draws or in dense stands of brush below the crest of hills. In enclosures with little cover they would dig into the snow and bed down. They did not use available artificial shelters. (29)

Of 8904 winter observations in central Montana of antelope on a sagebrush type, approximately one-half were located where the canopy cover of sagebrush was between 10 and 24 percent (21 to 40 plants intercepted per 200 feet of line transect). Table 2 (2).

Table 2. Antelope Winter Distribution in Relation to Sagebrush Density (2)

Cover	Observations
0 - 4%	7.5%
5 - 9	28.0
10 - 24	49.0
25+	15.5

Antelope observed in the sagebrush-grassland type in Montana during two summers revealed that at least 90% were on areas where big sagebrush density was between 6 and 20 plants per 100 feet of line. (32)

2. Food. Requirements include quantity and quality considerations. An adequate supply of acceptable, nutritious forage must be available for use at the required time and place.

a. Quantity. Antelope forage studies in fenced pastures in Wyoming (27) are summarized in Table 3.

Table 3. Seasonal Forage Consumption by Antelope. (27)

Season	Animal days	Lbs. used per animal/day *
Summer, 1964	833	1.6
Summer, 1965	1014	1.4
Fall, 1965	550	2.2
Fall & Winter, 1964	1545	1.8
Winter, 1965	751	2.5
Yearlong, 1964	2378	1.8
Yearlong, 1965	2342	1.9

* oven dried weight

Feeding trials with penned animals over an 18-day period averaged 1.5 (0.5 to 2.6) pounds per animal day. (26) In Utah, six captive antelope averaged 1.67 lbs/cwt in a 6-day feeding trial, however they also found some additional forage in the enclosure. (28) Six stomachs from antelope collected in southeastern Oregon during September contained an average of 8 pounds of bulk food material. (12, p.141)

b. Quality. Recommended nutritive levels for domestic sheep under range conditions are 4.4 percent digestible protein and 46 percent total digestible nutrients (TDN). An antelope feeding study in Utah determined that a shrub diet (December) consisting of species selected by the animals - Artemisia, 75 percent, Juniper, 20 percent and miscellaneous, 5 percent - was an adequate diet analyzing 5.3 percent digestible protein and 67 percent TDN. An antelope diet composed largely of sagebrush is adequate to provide proper nutrition. (28)

A standard laboratory analysis of five important browse species in Colorado showed that big sagebrush was the only one that maintained all nutritive qualities through the critical winter season. It compares favorably with alfalfa (Table 4). Protein content ranged from 14 percent in late winter to 11 percent in late spring. It rated very high in fat during winter when it is especially valuable. (10)

Browse has higher palatability and nutrient content than forbs in fall and winter. Antelope turn to forbs in spring even though browse is still high in nutrient. (15)

Table 4. **Feed Values, Sagebrush and Alfalfa** (10)

	Analysis (oven-dry) in %		Percent Digestible		Digestible Nutrients. %	
	Sage*	Alfalfa	Sage	Alfalfa	Sage	Alfalfa
Protein	10.1	19.4	52.3	62.4	5.2	11.9
Crude fat	9.8	3.3	77.2	59.1	17.0	4.8
Crude fiber	22.9	25.0	39.2	29.9	9.0	7.3
N-free extract	53.2	41.3	52.2	70.9	27.8	30.2
Ash	4.0	11.0				
Total	100.0	100.0				
TDN					59.0	54.2

*Artemisia tridentata

A study in Utah (3) indicated better fawn production following years with above average forage quality during fall and winter. Survival of fawns during the summer was best in years with heavy rainfall and abundant succulent forage during June through August.

c. Composition.

(1) Selection. No differences have been detected in food utilized by different age classes or sexes. Often range has been overgrazed by livestock to the extent that the pronghorn must accept whatever palatable green forbs he can find. Selection might be apparent if the ranges were in better condition. Antelope preference ratings are considerably influenced by the degree of livestock overgrazing. Many highly preferred food plants are eliminated. When the grama grasses have cured, antelope make little use of them, and prefer any green forb or browse to the grasses. They have a particular fondness for flowers and fruits, but all palatable and available plant parts are consumed (4) To state food preferences of antelope, the composition percentages of plant species available on antelope ranges must be known. (35)

Table 5, compiled from Tables 4 and 6 in (27), summarizes findings from a study within enclosed pastures near Wamsutter, Wyoming on forage production and utilization by antelope. Douglas rabbitbrush and big sagebrush were the most important species in the diet at each season.

PRONGHORN ANTELOPE

Table 5. **Forage Production, and Utilization by Antelope on Study Pastures, Red Desert, Wyoming.** (27)

Species	Production (Lbs/Ac)* 1964	1965	Utilization (Lbs/Ac) 1964	1965
Big sagebrush	147.0	266.7	13.2	9.6
Douglas rabbitbrush	89.4	88.7	20.1	26.2
Western wheatgrass	51.6	57.2	.2	.3
Needleandthread grass	19.3	21.1	T	T
Indian ricegrass	14.5	19.2	.1	.1
Squirreltail grass	13.0	14.9	.1	T
Winterfat	10.0	6.7	.9	.5
Sandberg bluegrass	3.6	7.7	T	.1
Obtuse sedge	3.1	8.1	.1	T
Forbs	T	2.6	-	-
Total	351.5	492.9	34.7	36.8

*Oven dried weight

Antelope are delicate feeders. Severson (24) noted that sagebrush plants showing 4 percent utilization by volume had about 86 percent utilization by frequency.

On short grass plains of eastern Colorado, grasses (especially buffalo grass and blue grama) predominate, making up 89.5 percent of the composition but it constitutes only 0.8 percent of the diet. Forbs are preferred. Antelope eat such agriculturally undesirable plants as snakeweed, astragalus, bull thistle, Russian thistle, rubberweed, globe mallow, larkspur, monkshood, cocklebur and yucca. (15)

Northern pronghorns feed mostly on browse. Many southern antelope, through lack of browse, must depend on forbs primarily. Grass, principally big bluestem, only amounts to about one percent in the diet. (5)

In southern Utah (14), a captive antelope herd on good condition shadscale-black sagebrush range made extensive use of forbs during the summer and fall of the wet year 1965. More than 70 percent of the diet consisted of forbs which produced only 14 percent of the forage. (Table 6) Six of these antelope were offered 16 species of browse over a six-day period. Major preferences in percent by weight were:

PRONGHORN ANTELOPE

Artemisia tridentata	54.5
Artemisia nova	20.7
Juniper osteosperma	19.8
Cowania stansburiana	2.8
Pinus monophylla	1.0

Shrubs used less than 1 percent were: *Cercocarpus intricatus*, *Atriplex canescens*, *Chrysothamnus stenopyllus*, *Prunus fasciculata*, *Ephedra nevadensis*, *Sarcobatus vermiculatus*, *Artemisia spinescens* and *Eurotia lanata*. No utilization was made of *Grayia spinosa*, *Chrysothamnus nauseosus* or *Atriplex confertifolia*.

Table 6. **Forage Production and Utilization in the** ***Atriplex-Artemisia*** **Type in Southwestern Utah.** Plot data, summer and fall, 1965 (14)

Species	Production Lbs/Ac	Utilization Percent of Diet
Shrubs		
Artemisia nova	15.9	23.4
Atriplex confertifolia	61.6	-
Chrysothamnus spp.	13.6	-
Ephedra nevadensis	9.8	4.6
Eurotia lanata	31.2	-
Gutierrezia sarothrae	23.2	-
Miscellaneous (6 species)	7.4	-
Shrub sub-total	162.7	28.0
Forbs		
Erigeron concinnus	0.5	4.6
Eriogonum spp.	5.3	3.0
Halogeton glomeratus	19.4	-
Sphaeralcea spp.	9.4	59.8
Miscellaneous (16 and 7 species respectively)	9.6	4.3
Forb sub-total	44.2	71.7
Grasses		
Bouteloua gracilis	9.8	-
Hilaria jamesii	23.5	-
Oryzopsis hymenoides	48.3	-
Sitanion hystrix	5.5	-
Sporobolus airoides	21.7	-
Stipa comata	1.0	-
Miscellaneous (2 and 1 species respectively)	1.1	0.3
Grass sub-total	110.9	0.3

PRONGHORN ANTELOPE

In western Utah, during years of above average rainfall, the diet of antelope consisted of:

Season	Browse	Forbs	Grass
		(Percent)	
Spring	45	20	35
Summer	10	90	-
Fall	55	45	-
Winter	95	5	-

During years of below average rainfall there was a reduction in forbs and an increase in browse. Green succulent forage appeared to be the major forage sought by antelope. (3)

Food habits observations of captive antelope on the enclosed five sections of range used in the Wamsutter, Wyoming fencing study indicated that during the spring green-up period antelope fed almost exclusively on green grass for almost two weeks. In a particularly dry summer they fed in the few draws where green grasses and forbs predominated. Generally after a rainstorm they fed on big sagebrush. Rabbitbrush was used throughout the year, but especially during dry periods when it was greener than other vegetation. Infrequently they fed almost exclusively on greasewood for periods of 3 to 5 days. Prickly pear apparently was little used. Winterfat and salt sage (Atriplex confertifolia) were particularly sought during the winter, and antelope spent much time on open flats, in winter, pawing through snow to these plants and would eat them to ground level. (29)

(2) Variety. Einarsen (12) states that the antelope adjusts its diet to the available supply, although the number of foods taken is large and varied. He lists utilization sight-records on 13 species of browse, 29 forbs, and 22 grass and grass-like plants in eastern Oregon:

	Spring	Summer	Fall	Winter
Grass	14	8	2	3
Forbs	17	15	4	1
Browse	4	2	2	5
Species total	35	25	8	9

In Colorado, 320 stomach samples included: 10 species of grass, 51 forbs, 16 browse, 5 crops, 2 cacti, plus sedges, lichens, mosses and mushrooms. (15)

In Texas, 228 species of plants were observed to be used. There were 160 forbs, 53 shrubs, and 15 grasses. (cited in 24)

PRONGHORN ANTELOPE

(3) Feeding Observations. In Montana, Cole (7) observed antelope feeding as reported below:

Season	No. of Observations	Greatest Utilization
Spring	844	Browse (*Artemisia*, 39%)
Summer	3594	Forbs (79.5%) 41 species
Fall	1178	Forbs 26 species
Winter	-	Browse (*Artemisia*)

Grass utilization was minor at all times.

In another study in central Montana (2) based upon observations of antelope feeding, winter forage consisted of 93% shrubs and 6% forbs. Big sagebrush, the most used plant with 78% of all observations, was the only plant present in significantly higher proportions in the diet than in the plant community. Table 7.

In the same area, observations during two summers indicated heavy use of forbs:

	1966	1967
Forbs	86	97
Shrubs	14	3
Grasses	T	T

The following 5 plants constituted 71% and 62% of the total observed use in these two years - a significantly higher proportion in the diet than in the plant community: *Artemisia frigida*, *Artemisia longifolia*, *Astragalus gilviflorus*, *Medicago sativa*, *Melilotus officinalis*. *Artemisia* species, both forb and shrub, comprised 28% and 14% of the total use observed at these sites. (32)

On the Red Desert, Wyoming (26) when rabbitbrush (*C. viscidiflorus*) began growth it became the most used plant until mid-summer. Sagebrush use increased in early fall and was the most used plant through the winter - sometimes the only one available above the snow. Winterfat was used only in late fall.

In Utah (14) antelope are most closely associated with the black sagebrush type. During a dry year (1964), *Artemisia nova* was the most used plant. Forbs were used more and black sagebrush less during a wet year (1965). *Poa secunda* was heavily utilized in early spring prior to seed formation. During June 1964, the diet consisted of forbs, 75 percent and black sagebrush, 25 percent. The early spring, 1965, diet consisted primarily of *Sphaeralcea*, *Eriogonum*, *Salsola*, *Artemisia nova* and *Atriplex canescens*. Euphorbias were preferred in late summer.

Table 7. **Winter Food Habits of Antelope in Central Montana, Based Upon 13,758 Observations at 28 Feeding Sites.** Frequency in percent. (2)

Major species	Jan.	Feb.	Mar.
Shrubs			
Artemisia cana	19	4	11
Artemisia tridentata	76	79	78
Chrysothamnus nauseosus	-	3	5
Symphoricarpos occidentalis	-	-	3
Total shrubs (Aver. 93%)	96	87	97
Forbs			
Artemisia frigida	Tr	11	3
Aster canescens	2	-	-
Total forbs (Aver. 6%)	3	11	3
Grasses			
Poa compressa	-	2	-
Total grasses	Tr	2	-

In Texas (4), of 214 feeding observations in summer, only 22 were on grass (mostly Bouteloua species). In the fall, of 428 observations only 37 were grasses.

(4) Stomach Analysis. Of the 189 stomachs sampled from Oregon-California-Nevada (Table 8), shrubs placed highest by at least 2:1 over forbs and 4:1 over grasses in all four seasons. Artemisia tridentata and A. arbuscula were highest in utilization by volume. Frequency of use during summer was high for Juniperus occidentalis, 17%; Chrysothamnus sp., 17%; Purshia tridentata, 57%; and Artemisia tridentata, 87%. (33)

In Montana (7), analysis of 27 rumen samples indicated browse (Artemisia) use was greatest in winter and spring, forbs in summer, and forbs and browse ranked about equal in early fall. Lomatium sp. and Artemisia ludiviciana were the principal forbs.

The average content of four stomach samples taken in Utah during August included Artemisia nova, 52; Solanum triflorum, 18; Euphorbia ocellata, 10; Sphaeralcea spp., 5; Prunus fasciculata, 4; and Eriogonum sp., 3 percent.(14)

PRONGHORN ANTELOPE

Twenty-six stomach samples collected at monthly intervals from the Hart Mountain herd in southeastern Oregon showed that Artemisia arbuscula was the most important plant yearlong. Sagebrush species made up 61% by volume and 96% frequency of all samples, and was represented each month. Two samples taken during July averaged 55% bitterbrush. Phlox species were important, amounting to 14% by volume and 46% frequency yearlong. Grasses, yearlong, by percent volume and frequency, amounted to: green, 1 and 23 and dry, 0.5 and 8 respectively. (17)

In central Montana, the contents of 12 rumen collected in summer included 10 percent Artemisia (forb and shrub). Five forbs accounted for 35 percent of the total contents. (32) Forty-five percent of the contents of 18 rumen taken in winter was Artemisia tridentata - the only plant with a significantly higher proportion in the diet than in the plant community. The principal forbs identified in the winter diet were Artemisia frigida and Opuntia polycantha. (2)

Of 56 stomach samples taken during May to September in northern California, 98 percent of the contents was browse and forbs. Big sagebrush amounted to 40 percent in spring; 35 percent in summer. There were few browse species present, but more than 60 species of forbs. Grass was a minor item in the diet but Bromus tectorum was the most important. (13)

Tables 8, 9 and 10 present data from these and other rumen analysis studies.

Table 8. Summary of Antelope Food Habits Data as Indicated by Rumen Analyses.

State	Grass	Forbs	Shrubs	Other	No. Sampled	Lit. Ref
			WINTER			
Great Basin Desert						
Ore.	9	0	91		4	17
Ore.	11	2	85		18	33
Ore.-Cal.-Nev.	6	7	85		40	33
Short Grass Plains						
Mont.	0	2	70	28**	13	8
Mont.	1	24	75		17	2
Mont.	2	0	98		6	7
Wyo.	8	2	88			24
Wyo.	2	-	98		12	27
Wyo.	4	2	84	10	8	27
Colo.	5	26	54	15*	74	15

PRONGHORN ANTELOPE

State	Grass	Forbs	Shrubs	Other	No. Sampled	Lit. Ref.
Colo.	10	20	70			34
N. M.	4	89	4	3*	7	22
N. M.	0	92	8		9	22
Short Grass and Pinyon-Juniper						
N. M.	4	25	60	11*	6	22
N. M.	0	2	75	23*	7	22
			SPRING			
Great Basin Desert						
Ore.	0	52	48		8	17
Ore.	19	37	42		17	33
Ore.-Cal.-Nev.	9	23	66		39	33
Cal.	2	35	63		20	13
Short Grass Plains						
Mont.	11	14	60	15**	6	8
Mont.	8	21	71		6	7
Colo.	20	51	25	4*	15	15
Colo.	6	31	63			34
N. M.	10	22	48	19*	6	22
N. M.	3	96	1		9	22
Short Grass and Pinyon-Juniper						
N. M.	17	33	48	2	7	22
N. M.	0	23	55	22*	6	22
			SUMMER			
Great Basin Desert						
Ore.	0	26	74		10	17
Ore.-Nev.-Cal.	0	32	65		23	33
Cal.	1	50	47		36	13
Salt Desert Shrub						
Utah	0	41	58		4	14
Short Grass Plains						
Mont.	2	54	34	10**	11	8
Mont.	1	85	14		12	32
Mont.	1	66	33		7	7
S. D.	0	26	63	11**	48	12
Wyo.	4	10	86		30	24
Wyo.	7	5	88		8	27
Colo.	1	66	22	11*	73	15
N. M.	0	80	17	3*	7	22
N. M.	0	91	9		7	22

PRONGHORN ANTELOPE

State	Grass	Forbs	Shrubs	Other	No. Sampled	Lit. Ref.
Short Grass and Pinyon-Juniper						
N. M.	1	73	26		7	22
N. M.	1	31	67		5	22
Mountain Brush (Artemisias, etc.)						
Colo.	4	2	94		7	15
Transition: Artemisia-Shadscale						
Colo.	1	60	37	2*	7	15
FALL						
Great Basin Desert						
Ore.	0	32	68		4	17
Ore.	0	14	86		14	33
Ore.-Nev.-Cal.	13	21	59		87	33
Short Grass Plains						
Mont.	1	9	80	10**	11	8
Mont.	1	48	50		8	7
Mont.	7	6	87			24
Wyo.	1	17	82		4	27
Wyo.	10	2	74	14	2	27
Colo.	1	22	72	5*	30	15
Colo.	4	63	33			34
N. M.	1	76	22	1*	7	22
N. M.	1	94	4	1*	6	22
Short Grass and Pinyon-Juniper						
N. M.	4	31	65		8	22
N. M.	1	50	49		7	22
Mountain Brush (Artemisias, etc.)						
Ida.	1	18	69	12**	31	12
Mixed Grass Prairie (?)						
Tex.	3	96	1		10	4
YEARLONG						
Ore.	2	31	67		26	17
Ore.-Nev.-Cal.	7	21	69		189	33
Mont.	2	20	62	16**	41	8
Mont.	3	34	63		27	7
Wyo.	3	5	92		24	27
Colo.	4	42	43	11*	192	15
Colo.	6	10	84			12
Colo.	7	28	65		20	34

PRONGHORN ANTELOPE

State	Grass	Forbs	Shrubs	Other	No. Sampled	Lit. Ref.
S.D.	4	17	67	12		12
N. M.	7	40	50	3*	28	22
N. M.	4	67	22	7*	27	22
N. M.	1	94	5		31	22
N. M.	1	27	61	11*	25	22
Tex.	4	66	30			6
Total					606	
Average	4	38	53	5		

* Cactus (shrub)
** Crop

Table 9. Principal Antelope Forage Species
Based on Rumen Analyses

Species	State	Samples	Season*	Value (%)	
				Volume	Frequency
Shrubs					
Artemisia arbuscula	Nev-Ida-Ore	40	W	26	-
" "	"	87	F	10	14
" "	Ore	4	F	45	50
" "	"	26	YL	61	96
" cana	"	10	Su	20	20
" "	Mont	1	W	84	85
" filifolia	N. Mex	6	Sp	34	50
" "	"	7	F	14	43
" frigida	Mont	3	Su	41	33
" "	N. Mex	7	W	42	86
" "	"	6	Sp	46	83
" "	"	5	Su	14	80
" "	"	8	F	13	25
" nova	Utah	4	Su	52	
" tridentata	Nev-Ida-Ore	40	W	57	33
" "	"	39	Sp	56	33
" "	"	23	Su	35	87
" "	"	87	F	41	81
" "	Ore	4	W	89	100
" "	"	8	Sp	48	100
" "	"	10	Su	37	70
" "	"	4	F	21	50

PRONGHORN ANTELOPE

Species	State	Samples	Season	Value (%)	
				Volume	Frequency
Artemisia tridentata	Cal	20	Sp	41	90
" "	"	36	Su	35	89
" "	Wyo	12	W	90	100
" "	"	8	W	65	100
" "	"	8	Su	55	100
" "	"	4	F	58	100
" "	"	2	F	40	100
" "	Mont	18	W	45	100
A. frigida, tridentata	"	6	Sp	65	70
Atriplex confertifolia	Nev-Ida-Ore	40	W	-	38
Chrysotham. viscidiflorus	Wyo	12	W	7	83
" "	"	8	W	17	100
" "	"	8	Su	30	100
" "	"	4	F	23	100
" "	"	2	F	33	100
Fallugia paradoxa	N. Mex	9	W	8	22
Gutierrezia californica	"	7	Su	9	14
" "	"	7	F	10	28
" sarothrae	"	9	W	39	100
" "	"	6	F	16	100
Juniperus sp.	"	7	W	6	57
Opuntia sp.	"	7	W	23	43
"	"	6	Sp	22	83
Prosopsis juliflora	"	6	Sp	14	33
" "	"	7	Su	16	100
" "	"	7	F	8	71
Purshia tridentata	Nev-Ida-Ore	23	Su	-	57
" "	Ore	10	Su	11	30
" "	"	3	Su	36	-
" "	Cal	20	Sp	14	60
" "		36	Su	10	39
Rhus trilobata	N. Mex	5	Su	5	20
Forbs					
Aplopappus spinulosus	N. Mex	7	F	12	86
Artemisia carruthii	"	6	W	46	100
" "	"	7	Sp	24	100
" "	"	8	F	51	88
" "	"	5	Su	47	60
" ludoviciana	Mont	7	Su	29	31
" "	N. Mex	7	Su	7	14
Aster hirtifolius	"	9	W	17	44
" "	"	9	Sp	17	67
" spp.	Mont	2	Su	23	15

PRONGHORN ANTELOPE

Species	State	Samples	Season	Value (%) Volume	Value (%) Frequency
Astragalus sp.	N. Mex	7	Sp	6	57
" "	"	7	Su	11	100
Bahia oppositifolia	"	6	W	7	17
Eriogonum havardii	"	9	W	21	67
" "	"	9	Sp	5	33
" "	"	6	F	21	67
" jamesii	"	6	Sp	7	100
" sp.	"	5	Su	9	20
Euphorbia ocellata	Utah	4	Su	10	-
" sp.	N. Mex	7	Su	9	43
" "	"	7	F	15	14
" "	"	6	Sp	6	33
Gaura coccinea	"	9	Sp	14	67
" "	"	7	Su	5	57
Grindelia squarrosa	"	7	Su	8	71
" "	"	8	F	8	75
Hoffmanseggia densiflora	"	7	Su	13	57
" jamesii	"	6	Sp	8	33
Hymenopappus flavescens	"	7	W	23	28
" "	"	7	F	29	43
Iva axillaris	Cal	36	Su	17	56
Lomatium foeniculaceum	Mont	6	Sp	11	7
" sp.	Cal	20	Sp	6	25
Oenothera caespitosa	N. Mex	7	W	5	14
Phlox sp.	Ore	8	Sp	30	88
" "	"	10	Su	5	10
" "	"	4	F	17	100
" "	"	26	YL	14	46
" "	Cal	20	Sp	5	50
Polygonum aviculare	"	36	Su	5	19
Portulaca oleraceae	N. Mex	7	Su	9	57
" sp.	"	5	Su	11	20
Sisymbrium altissimum	Cal	36	Su	5	8
Solanum triflorum	Utah	4	Su	18	
Sphaeralcea coccinea	Mont	2	Su	18	33
Stenandrium barbatum	N. Mex	9	W	6	67
" "	"	9	Sp	17	33
" "	"	7	Su	26	71
" "	"	6	F	21	100
Tragopogon dubius	Mont	2	Su	22	17
Zinnia grandiflora	N. Mex	7	W	25	43
" "	"	6	Sp	7	50
" "	"	7	Su	9	57

* W, Winter; Sp, Spring; F, Fall; Su, Summer; YL, Yearlong

PRONGHORN ANTELOPE

Table 10. Plants Consumed in Low Volume but High Frequency (California). 56 stomach samples. Data expressed in percent. (13)

	Frequency		Volume	
	Spring	Summer	Spring	Summer
Browse				
Amelanchier alnifolia	10		0.8	
Arctostaphylos sp.	10		T	
Chrysothamnus nauseosus	35	19	3.8	1.2
" viscidiflorus	30	6	4.1	T
Grayia spinosa	10		0.3	
Juniperus occidentalis	20	22	0.1	0.1
Grass				
Bromus tectorum	60	8	0.1	T
" sp. (florets)	20	11	T	T
Grass, dry	15	28	0.5	T
Grass, green	60	14	1.0	1.0
Forbs				
Astragalus sp.	20		0.2	
Balsamorrhiza sp.	10		4.5	
Colinsia sp.	40		T	
Eriogonum sp.	50	22	0.6	0.2
Eriophyllum lanatum	15	17	T	2.2
Erodium cicutarium	25	6	T	0.6
Lactuca sp.		14		0.5
Lagophylla ramosissima		14		1.9
Lepidium sp.	15	14	T	T
Medicago sativa		3		1.5
Penstemon deustus	20	8	0.6	0.2
Ranunculus sp.	15		0.2	
Rumex salicifolius		28		0.6

d. Salt. It is generally agreed that antelope are fond of salt. They may use salt placed for livestock and natural salt licks. (24) In Colorado, captive fawns learned to use common salt blocks but avoided iodized salt. (15) Even during winter captive antelope on fenced pastures would paw at an old sheep salt lick and eat the earth. (29) Salt is only a minor attractant in Wyoming. (36)

3. Water. It is generally agreed that antelope can subsist on succulent vegetation alone, but they will drink daily if water is readily available. (12, 15, 16, 24) They may move to ranges where water is available and leave ranges when water is unavailable. In Montana, cacti consumption was believed to be related to antelope need for water. Snow may be used in winter. (15) In some areas antelope reportedly are reluctant to drink from metal stock tanks but on the Red Desert such use was frequently observed. Here, during a census in July, 95 percent of the antelope observed were within three to four miles of water. (31)

In the study at Wamsutter, Wyoming, water consumption by antelope was markedly affected by: total monthly precipitation, evaporation, succulent vegetation, nursing does, average temperature, and average maximum temperature. In the fenced pastures the daily water consumption of 25-35 antelope varied from a high of 1.1 gal./head average for the month of August to less than 0.1 gallons in May. During spring green-up, some animals did not water for 3 to 5 days. Fawns were observed drinking by August. Water was a critical environmental factor from early July to the beginning of October. (29, 31)

Range water development in Wyoming has been a major factor in improving antelope distribution. (36)

In Utah (3) where water consumption by antelope was measured over a four-year period, the amount used varied inversely with the amount and succulence of preferred forage species. When forbs were abundant and their moisture content was 75 percent or more, the antelope did not drink water - even though it was readily available. As the vegetation dried, water consumption increased. During extremely dry periods, three quarts of water were used per animal per day.

4. Space. Section D, Movements, stated that antelope do not thrive when their range area is restricted. Seasonal movements to available water or to avoid snow, as in parts of Wyoming, may extend 30 or 40 miles or more. Nelson (18) and others have cited instances of severe population losses when antelope movements were restricted by fences. The policy regarding antelope stocking on sheep-fenced areas in New Mexico is to avoid pastures with an area of less than ten sections. (20 p. 37) Hoover, et al., (15) in Colorado, recommended for antelope transplanting purposes, at least one square mile of native range per animal for not less than 100 animals. They support the theory that there is a minimum population level for gregarious animals below which they are not likely to survive.

F. Management Factors.

1. Compatibility with other wildlife. A general lack of information in the literature indicates there are few serious conflicts. On many antelope ranges in New Mexico deer are present and there are at least three localities where elk are also present. (22) White-tailed deer and elk may offer serious competition with antelope in the Oklahoma-Texas area. On the Wichita Mountains wildlife refuge white-tailed deer foods were almost identical with those of reintroduced antelope during late spring and early summer when forbs are predominant in their diet, as shown below: (5)

	Forbs	Grass
	Percent	
Antelope	99	1
White-tailed deer	99	0
Elk	24	65
Bison	1	99

In Wyoming, antelope have been observed in the same general locality as mule deer and elk. (36)

2. Compatibility with livestock.

a. Cattle. There is very little competition with cattle or horses on good condition range as they largely utilize grass. In fact, cattle ranges may be improved by the presence of antelope. By computing conversion factors, it was calculated that 105 antelope in Colorado would consume as much cattle forage as one cow. (15) Several authors have maintained that antelope have no aversion to feeding with cattle. (27) Food habits studies in northeastern California showed that antelope did not severely compete with cattle. (13) In western Texas, antelope apparently prosper well on cattle range even if overgrazed. It was estimated that about 38 antelope consumed as much cattle forage as one cow. (4)

b. Sheep. Severson, et al., (27) stated that the degree of forage competition between antelope and sheep varied greatly, depending on geographic area and the general vegetation type. Buechner reported that overgrazed sheep ranges in Texas are unsuitable for antelope because of the severe competition. (4) Competition is most severe where antelope and sheep share the same wintering ground. Hancock (14) reported that year-round livestock use and feeding of protein supplement on winter sheep ranges has had a marked deleterious effect on the black sage type in Utah.

PRONGHORN ANTELOPE

Antelope are in direct competition with sheep for forbs and browse. On short grass range in Colorado, it is estimated that 7 antelope will eat as much grass as one sheep. (15)

In the BLM cooperative study of the effects of various fences on antelope movements conducted at Wamsutter, Wyoming (30), it was observed that antelope at first remained apart from the sheep in dual use pastures. After some months they did mingle and were often seen feeding and watering together. There appeared to be no stress by either antelope or sheep due to common use of the range. In general sheep preferred grasses whereas antelope utilized shrubs. Forbs were a minor component of the vegetation. Most important to antelope were Artemisia tridentata and Chrysothamnus viscidiflorus. Sheep principally utilized Oryzopsis hymenoides and Stipa comata. There were no significant differences in consumption of these key forage plants, by antelope and sheep, in the single and dual use pastures. Also, the total pounds of forage consumed did not vary. There was an 8.2 percent overlap on a yearly basis in the species used. On an animal-unit basis, 5.67 sheep consumed as much shrub weight as one antelope and 43.5 antelope used as much grass as one sheep. The principal overlap in use was: Spring, bluegrass and sagebrush; summer, none; late fall and early winter, winterfat; late winter, sagebrush. Sheep utilization of shrubs was largely in winter when grass was unavailable. The major overlap was with big sagebrush in winter. Sheep used grass and antelope used rabbitbrush as soon as growth started. In dual use pastures, winterfat was the most preferred species. The carrying capacity of one 120 acre pasture was 8.0 antelope or 7.2 sheep for one year under single use or 6.0 antelope and 6.2 sheep under dual use. It was concluded that there was little competition between antelope and sheep in the study area. (24, 27, 29)

Under present conditions of management of the majority of western antelope ranges the stocking of sheep on antelope ranges may be considered detrimental to optimum antelope production and in many cases, especially where supplement is fed or snow cover persists, will severely limit antelope production.

Table 11. **Forage Consumption of Antelope and Sheep in Study Pastures,** Wamsutter, Wyoming. Big sagebrush vegetation type. Percent by volume. (27 from Tables 7 and 9)

	WINTER				YEARLONG	
Species	Antelope		Sheep		Antelope	Sheep
	1964	1965	1964	1965	1964	
Shrubs	98.3	84.4	42.7	53.0	92.1	28.4
Rabbitbrush	7.3	17.2	2.0	7.0	17.0	1.7
Sagebrush	90.4	65.2	28.3	10.4	73.0	15.8
Winterfat	0.6	1.9	12.4	35.6	0.8	10.9
Forbs	T	1.7	1.2	3.2	4.7	2.6
Grasses	1.7	3.9	56.1	40.0	3.2	69.0
Unidentified	0	9.9	0	4.0	0	0

Table 12. **Estimated Pounds Consumed Per Acre of the Principal Forage Species as Determined by Range Analysis.** Yearlong, 1965. Wamsutter, Wyoming. (27 from tables 6, 8, 10)

Species	Antelope	Sheep	Dual Use
Rabbitbrush	26.2	2.0	12.8
Big sagebrush	9.6	1.5	4.6
Winterfat	0.5	2.9	1.5
Indian ricegrass	0.1	10.6	4.4
Needle-and-thread	T	10.0	5.2
Lbs. used/ac.	36.8	32.5	32.6
Lbs./animal/day	1.9	1.6	1.7

3. Damage to cultivated crops. In the 1920's and earlier, antelope were feeding in alfalfa fields - in Idaho just after cutting, in Colorado during winter. In Wyoming they consumed much bundled grain in the fields, and in winter ate stacked hay. (18) In the 1930's Einarsen (11) reported few complaints of competition for food between domestic animals and antelope, except on fenced ground where they persistently enter isolated fields of alfalfa, meadow grass or grain.

Ferrel and Leach (13) found that in northeastern California alfalfa was the only crop taken (1.5% of summer diet based on 36 stomachs analyzed). No grain was taken although antelope were frequently observed in harvested and unharvested fields. Trampling and bedding caused some damage.

In Colorado, farm crops found in stomachs included wheat, sorghum, milo, alfalfa and pinto beans. Winter wheat, taken between November and April, made up 74 percent of the diet of 98 out of 192 stomach samples. (15)

Analysis of 48 antelope stomach samples collected during summer in South Dakota revealed 11 percent crop material. And 31 fall-collected stomachs in Idaho contained 12 percent crops. (12)

Utilization may occur throughout an alfalfa field, although it is greatest near the point of entrance. Observations on 13 alfalfa fields in Montana showed use by antelope from May to October with the greatest use in August and September. Alfalfa fields occupying 4.3 percent of the study area sustained 14.5 percent of the total use. About one-third of the animals observed during the fall were on alfalfa fields. In one small field (23.5 acres), 90 percent of the alfalfa stems along transects had been utilized. Protected plants averaged 8 inches (83%) higher and had 63 more blooms and/or pods per plant than the unprotected plants. Antelope rarely bedded on alfalfa. Only minor use was made of crested wheatgrass seedings. (7)

Cole (8) studying the effect of antelope utilization of wheat fields in Montana noted that grazing of wheat would be most damaging from the time culms start elongating (mid-May) until harvest. Relatively few antelope used fields at this time. Dry-land winter wheat fields were used appreciably only during fall and winter. Over twenty-eight thousand observations made in a two-year period indicated 21 percent of yearlong use was made on the 20 percent of the study area in wheatland (including fallow). It amounted to 30 percent during fall, and 28 percent in winter. Plot studies showed no significant difference in yields. Antelope commonly bedded on grain fields but not at times when vision would be obstructed. There was some trampling on trails across fields to water or rangeland. Stomach analyses conducted as part of this study showed crop content (as percent by volume) as follows:

Season	No. of rumen	Percent crop
Winter	13	28
Spring	6	15
Summer	11	10
Fall	11	10
Yearlong	41	16

Much of this was considered to be waste grain.

PRONGHORN ANTELOPE

PLANT REFERENCE LIST

Grasses and Grasslike

Scientific Name	Common Name
Agropyron cristatum	Crested wheatgrass
Agropyron smithii	Western wheatgrass
Andropogon gerardi	Big bluestem
Bouteloua gracilis	Blue grama
Bromus tectorum	Cheatgrass
Buchloe dactyloides	Buffalo grass
Carex obtusata	Obtuse sedge
Hilaria jamesii	Galleta
Oryzopsis hymenoides	Indian ricegrass
Poa compressa	Canada bluegrass
Poa secunda	Sandberg bluegrass
Sitanion hystrix	Squirreltail
Sporobolus airoides	Alkali sacaton
Stipa comata	Needle-and-thread

Forbs

Aconitum sp.	Monkshood
Aplopappus spinulosus	Goldenweed
Artemisia carruthii	
Artemisia longifolia	Longleaf sagebrush
Artemisia ludiviciana	Sagewort
Aster canescens	Aster
Aster hirtifolius	Aster
Astragalus gilviflorus	Three-leafed milkvetch
Astragalus sp.	Astragalus, loco
Bahia oppositifolia	Bahia
Balsamorrhiza sp.	Balsamroot
Cirsium sp.	Bull thistle
Collinsia sp.	Blue-eyed Mary
Delphinium sp.	Larkspur
Erigeron concinnus (pumilus)	Hairy daisy
Eriogonum havardii	Wild buckwheat
Eriogonum jamesii	Wild buckwheat
Eriogonum sp.	Wild buckwheat
Eriophyllum lanatum	Common woolly-sunflower
Erodium cicutarium	Filaree
Euphorbia ocellata	Valley spurge
Euphorbia sp.	Spurge

PRONGHORN ANTELOPE

Scientific Name	Common Name
Gaura coccinea	Scarlet gaura
Grindelia squarrosa	Gumweed
Halogeton glomeratus	Halogeton
Hoffmanseggia densiflora	Indian rushpea (Hog-potato)
Hoffmanseggia jamesii	Hoffmanseggia
Hymenopappus flavescens	White ragweed
Hymenoxys sp.	Rubberweed, Pingue
Iva axillaris	Poverty weed
Lactuca sp.	Lettuce
Lagophylla ramosissima	Common hareleaf
Lepidium sp.	Pepperweed
Lomatium foeniculaceum	Lomatium
Lomatium sp.	Lomatium
Medicago sativa	Alfalfa
Melilotus officinalis	Yellow sweetclover
Oenothera caespitosa	Tufted evening primrose
Penstemon deustus	Penstemon
Phlox sp.	Phlox
Polygonum aviculare	Prostrate knotweed
Portulaca oleraceae	Common purslane
Ranunculus sp.	Buttercup; crowfoot
Rumex salicifolius	Willow dock
Salsola kali	Russian thistle
Sisymbrium altissimum	Tumble-mustard
Solanum triflorum	Cutleaf nightshade
Sphaeralcea coccinea	Scarlet globemallow
Stenandrium barbatum	
Tragopogon dubius	Salsify
Xanthium sp.	Cocklebur
Zinnia grandiflora	Zinnia

Shrubs

Scientific Name	Common Name
Amelanchier alnifolia	Common serviceberry
Arctostaphylos sp.	Manzanita
Artemisia arbuscula	Low sagebrush
Artemisia cana	Silver sagebrush
Artemisia filifolia	Sand sagebrush
Artemisia frigida	Fringed sagebrush
Artemisia nova	Black sagebrush
Artemisia spinescens	Bud sagebrush
Artemisia tridentata	Big sagebrush
Atriplex canescens	Fourwing saltbush
Atriplex confertifolia	Shadscale

PRONGHORN ANTELOPE

Scientific Name	Common Name
Cercocarpus intricatus	Littleleaf mountain mahogany
Chrysitgamnus nauseosus	Rubber rabbitbrush
Chrysothamnus stenophyllus	Little rabbitbrush
Chrysothamnus viscidiflorus	Douglas rabbitbrush
Cowania stansburiana (C. mexicana)	Cliffrose
Aphedra nevadensis	Nevada jointfir
Eriogonum wrightii	Buckwheat (shrub)
Eurotia lanata	Winterfat
Fallugia paradoxa	Apacheplume
Grayia spinosa	Spiny hopsage
Gutierrezia californica	Snakeweed
Gutierrezia sarathrae	Broom snakeweed
Juniperus occidentalis	Sierra juniper
Juniperus osteosperma	Utah juniper
Opuntia polycantha	Plains pricklypear
Opuntia sp.	Pricklypear
Pinus monophylla	Singleleaf pinyon
Prosopsis juliflora	Mesquite
Prunus fasciculata	Desert almond (peachbrush)
Purshia tridentata	Antelope bitterbrush
Rhus trilobata	Squawbush
Sarcobatus vermiculatus	Greasewood
Symphoricarpos occidentalis	Western snowberry
Yucca sp.	Yucca

Literature Cited

1. Bailey, Vernon. 1936. Mammals and Life Zones of Oregon. N. A. Fauna No. 55. USDA
2. Bayless, Steve. 1968. Food habits, range use and home range of pronghorn antelope in central Montana during winter. Proc. 3rd Bien. Antelope States Workshop. Casper. pp. 104-114 *
3. Beale, D. M., G. W. Scotter and A. D. Smith. 1969. Some antelope-range relationships in the west desert of Utah. Abstract of Papers. 22nd Annual Meeting. American Society of Range Mgt., Calgary
4. Buechner, H. K. 1947. Range use of the pronghorned antelope in western Texas. Trans. N. A. Wildl. Conf. 12:185-192
5. Buechner, H. K. 1950. Range ecology of the pronghorn on the Wichita Mountains wildlife refuge. Trans. N. A. Wildl. Conf. 15:627-644
6. Buechner, H. K. 1950. Life history, ecology, and range use of the antelope in Trans-Pecos, Texas. Am. Midland Nat. 43(2):257-354
7. Cole, Glen F. 1956. The Pronghorn Antelope - its range use and food habits in Central Montana with special reference to alfalfa. Mont. State Col. Exp. Sta. Bul. 516, 63 pp.
8. Cole, G. F. and B. T. Wilkins. 1958. The Pronghorn Antelope - its range use and food habits in central Montana with special reference to wheat. Mont. Fish & Game Dept. Tech. Bull. No. 2. 39 pp.
9. Dasmann, Wm. P. 1962. Big Game of California. Dept. of Fish & Game. 56 p.
10. Dietz, Don R. 1957. Exploratory analysis of browse samples. Colorado Cooperative Wildlife Res. Unit. Qtrly reports, V. 11, 12. Fort Collins
11. Einarsen, A. S. 1938. Life history and management of antelope in Oregon. Trans. N. A. Wildlife Conf. 3:381-387
12. Einarsen, A. S. 1948. The Pronghorn Antelope and its Management. The Wildlife Management Institute, Wash., D. C. 238 p.
13. Ferrel, C. M. and H. R. Leach. 1950. Food habits of the prong-horn antelope of California. Calif. Fish & Game, 36(1):21-26
14. Hancock, N. V. 1966. Wildlife use of the Salt Desert Shrub areas of the Great Basin. In: Salt Desert Shrub Symposium (proceedings), BLM, Cedar City, Utah. pp.101-112
15. Hoover, R. L., C. E. Till, and S. Ogilvie. 1959. The Antelope of Colorado. Game and Fish Dept., Colo. 110 p.

---

* Or see J. Wildl. Mgmt. 33(3):538-551. 1969

PRONGHORN ANTELOPE

16. Martin, A. C., H. S. Zim and A. L. Nelson. 1951. American Wildlife and Plants. McGraw-Hill (Paperback: 1961, Dover Publications, N. Y.) 500 pp.

17. Mason, Ellis. 1952. Food Habits and Measurements of Hart Mountain Antelope. J. Wildl. Mgt. 16(3):387-389

18. Nelson, E. W. 1925. Status of the Pronghorned Antelope. 1922-1924. USDA Dept. Bull. No. 1346. 64 p.

19. Nielson, E. and E. Fichter. 1966. Pronghorn Antelope. Idaho Wildlife Review 19(2):3-7

20. Proc. 3rd Bien. Antelope States Workshop, Casper. 1968

21. Quimby, Don. 1966. Statement at Interagency Meeting on the Control of Big Sagebrush. Bozeman, Mont. Mar. 23, 1966

22. Russell, T. P. 1964. Antelope of New Mexico. N. M. Dept. Game & Fish Bull. No. 12, 103 pp.

23. Seton, E. T. 1929. Lives of Game Animals. V. 3, p. 421. The Literary Guild of America, Inc. New York

24. Severson, K. E. 1966. Grazing capacities and competition of pronghorn antelope and domestic sheep in Wyoming's Red Desert. Ph. D. Thesis, U. of Wyoming, Laramie. 119 pp.

25. Severson, K. E. 1966. Material prepared for Salt Desert Shrub Symposium Presentation. In: Salt Desert Shrub Symposium (proceedings), BLM, Cedar City, Utah. pp. 113-129

26. Severson, K. E. and M. May. 1967. Food Preferences of Antelope and Domestic Sheep in Wyoming's Red Desert. J. Range Mgt. 20(1):21-25

27. Severson, K., M. May and W. Hepworth. 1968. Food preferences, and carrying capacities, and forage competition between antelope and domestic sheep in Wyoming's Red Desert. Sci. Mono. 10. Agri. Expt. Sta., U. of Wyo. 51 pp.

28. Smith, A. D., D. M. Beale, D. D. Doell. 1965. Browse preferences of pronghorn antelope in southwestern Utah. Trans. N. A. Wildl. Conf. 30:136-141

29. Spillett, James J. 1964. A synopsis of the literature and miscellaneous observations on the pronghorn antelope (Antilocapra americana). Special Report No. 13, Utah Coop-Wildl. Res. Unit, Logan. 38 pp. duplicated

30. Spillett, J. J., J. B. Low, and D. Still. 1967. Livestock fences - how they influence pronghorn antelope movements. Bull. No. 470. Agri. Expt. Sta., Utah State U., Logan. 79 pp.

31. Sundstrom, Charles. 1968. Water consumption by pronghorn antelope and distribution related to water in Wyoming's Red Desert. Proc. 3rd Bien. Antelope States Workshop. Casper. pp. 39-46

32. Wentland, H. J. 1968. Summer range habits of the pronghorn antelope in central Montana with special reference to proposed sagebrush control study plots. Proc. 3rd Bien. Antelope States Workshop. Casper. pp. 99-103

33. Yoakum, Jim. 1958. Seasonal Food Habits of the Oregon Pronghorn Antelope. Trans. Interstate Antelope Confer.

34. Yoakum, Jim. 1967. Literature of the American Pronghorn Antelope. BLM. USDI. Reno.

35. Yoakum, Jim. 1968. A review of the distribution and abundance of American pronghorn antelope. Proc. 3rd Bien. Antelope States Workshop Casper . pp.4-14

36. ZoBell, Rex. 1968. A review of antelope crossing devices field trials of antelope passes in Buffalo Basin. Proc. 3rd Bien. Antelope States Workshop Casper . pp. 28-30

37. ZoBell, Rex S. 1968. Field studies of antelope movements on fenced ranges. Trans. N. A. Wildlife Conf. 33:211-216